Commodore
The Transactor

comments and bulletins
concerning your
COMMODORE PET

BULLETIN #2
June 15, 1978

BULLETIN No. 2

Below are a number of notes regarding useful information referring to the PET computer in use. At the end of this bulletin are a number of programs, a comparison between BASIC and FORTRAN and a user's report.

* * *

Operating System Bugs:

Some of the bugs that people have written about:

1. Array addresses are calculated modulo 256(0-255 size limit).
2. SPC(0) results in SPC(256).
3. RIGHTS$(A$,0) causes ILLEGAL QUANTITY error message.
4. RND(0) gives the same number each time it is called, not the same sequence.

RND for negative arguments does strange things --i.e. -.01,-.02,-.04,-.08,-.16, etc. all return the same number.

Hardware available:

Convenience Living Systems, 648 Sheraton Drive, Sunnyvale, CA 94087 EXPANDAPET for $435 assembled with 16K RAM, sockets for 4K EPROM, 2 parallel 1/O ports with handshake, slots for 3 option cards, and all cables and brackets.

Forethough Products, Box 8066, Coburg, OR 97401. The PETSI PET to S-100 interface/motherboard. $105 kit or $160 assembled. Includes 4 slots, dynamic memory controller, and sockets for 8K 2716 EPROM.

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The Net Works, 5014 Narragansett #6, San Diego, CA 92107 has an IEEE to RS-232 board (with dual ports) for $160 assembled and tested including on board power supplies. They also announced their TNW-488 Low Speed Modem Module to interface IEEE-488 (PET connector version) to the telephone network using the BELL 103A standard. Doug Gage, one of TNW's proprietors sent preliminary announcement specs and some documentation. He also said they had a prototype running for some time, and are now producing the first units at $225 assembled.

The 8 **bit** user port is actually part of an MOS Technology MCS 6522 Versatile Interface Adapter (VIA). You can get a copy of the VIA data sheet from Commodore Business Machines, 3370 Pharmacy Avenue, Agincourt, Ont. (416)499-4292.Most of the VIA's features apparently are used for the PET itself, leaving only an 8 bit port and two handshake lines, which are really quite simple to use.

The new PET user manual briefly describes the 8 bit port edge connector, pins A and N are grounded, pin B is CA1, the input handshake line, pin M is CB2, the output handshake line, and pins C through L are the 8 data lines, with C being the high order (leftmost) and L the low order bit. When the PET is turned on, the 8 data bits are programmed to act as inputs and CA1 is programmed to recognize a negative transition (from 1 to 0).

To generate an audio signal from the PET a programmable square wave generator is included in the MCS6522 which interfaces the PET Parallel User Port. When the tape drive is not in operation, the generator can be used to produce one of 514 different frequencies between 243HZ and 125KHZ on CB2 (User Port pin M). The 6522 makes this possible by recirculating shift register intended for serial data input and output. With a square wave pattern loaded into the shift register and the control set for free running output under timer controlled rate, a continuous square wave is produced on CB2.

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The BASIC statements needed to control the output are as follows:

POKE 59467,16	Sets shift register to free running output mode.
POKE 59464,C	Sets shift rate. C is an integer of 0 to 255.
POKE 59466,D	Loads shift register. D should be 15, 51, or 85 for a square wave output.

The frequency of the square wave can be determined from the following equation:

$$\text{FREQUENCY} = \frac{500000 \text{ HZ}}{(C+2)(D1)}$$

Where: D1 = 8 for D= 15
D1 = 4 for D= 51
D1 = 2 for D= 85

Reading or writing the shift register must be done last as this initiates the shifting operation. The control register at 59467 must be reloaded with 0 for the tape drive to write correctly.

Do not connect a speaker or earphones directly to the CB2 output of the PET. An amplifier is necessary to isolate the 6522 from inductive loads.

The TAPE #2 READ signal on User Port pin 8 (TAPE #2 READ and TAPE WRITE are reversed in the introductory manual) appears to be the CB1 line from the 6522 and carries the shift clock signal. With both CB1 and CB2 available, it may be possible to use the I/O port expansion scheme described in the MCS6522 Data Sheet.

PET CODES:

There are two ways to write to the screen of your PET: either POKEing screen memory (32768-33767) or by PRINTing. Besides this, there are two ways in which memory is interpreted by the character generator: standard mode (location 59468 = binary XXXX110X) or lower case mode (location ≠XXXX110X). Some of this confusion may be simplified with a character code chart. In the chart the OFF and RVS columns refer to values POKEed in screen memory whereas CHR$ refers to the PRINT statement. Thus, either POKE 32768, 129 or PRINT CHR$(18) CHR$(65) will show a reverse A.

This simple program: 10 INPUT M,N:PRINT M;N,"AA"CHR$(M) CHR$(N)"BB":GOTO 10 allows you to explore the full CHR$ set including cursor and reverse. The chart gives CHR$ codes from (0-95) and (128-223). The missing values in the chart have the equivalents:(96-127) = (32-63), (224-254) = (160-190), and 255 = 222.

By referring to an ASC11 code chart we see that ASC11 (0-95) = PET(0-95) but that ASC11(96-127) = PET(192-223), ie. displaced by 96.

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The printing mode (standard or lower case) is set by POKEing an address. So as not to disturb any of the other bits in the peripheral control register a safe way to set the lower case mode would be: POKE 59468,PEEK(59468) OR 14 and reset it to standard mode with POKE 59468, PEEK(59468) AND 253 OR 12.

Standard Mode: Location 59468 = XXXX110X

	OFF	RVS	CHR$
@	64	192	192
	0	128	64
A	65	193	193
	1	129	65
B	66	194	194
	2	130	66
C	67	195	195
	3	131	67
D	68	196	196
	4	132	68
E	69	197	197
	5	133	69
F	70	198	198
	6	134	70
G	71	199	199
	7	135	71
H	72	200	200
	8	136	72
I	73	201	201
	9	137	73
J	74	202	202
	10	138	74
K	75	203	203
	11	139	75
L	76	204	204
	12	140	76
M	77	205	205
	13	141	77
N	78	206	206
	14	142	78
O	79	207	207
	15	143	79
P	80	208	208
	16	144	80
Q	81	209	209
	17	145	81
R	82	210	210
	18	146	82
S	83	211	211
	19	147	83
T	84	212	212
	20	148	84
U	85	213	213
	21	149	85
V	86	214	214
	22	150	86
W	87	215	215
	23	151	87
X	88	216	216
	24	152	88
Y	89	217	217
	25	153	89
Z	90	218	218
	26	154	90
[	91	219	219
	27	155	91
\	92	220	220
	28	156	92
]	93	221	221
	29	157	93
↑	94	222	222
	30	158	94
←	95	223	223
	31	159	95
SP	96	224	160
	32	160	32
!	97	225	161
	33	161	33
"	98	226	162
	34	162	34
#	99	227	163
	35	163	35
$	100	228	164
	36	164	36
%	101	229	165
	37	165	37
&	102	230	166
	38	166	38
'	103	231	167
	39	167	39
(	104	232	168
	40	168	40
)	105	233	169
	41	169	41
*	106	234	170
	42	170	42
+	107	235	171
	43	171	43
,	108	236	172
	44	172	44
-	109	237	173
	45	173	45
.	110	238	174
	46	174	46
/	111	239	175
	47	175	47
0	112	240	176
	48	176	48
1	113	241	177
	49	177	49
2	114	242	178
	50	178	50
3	115	243	179
	51	179	51
4	116	244	180
	52	180	52
5	117	245	181
	53	181	53
6	118	246	182
	54	182	54
7	119	247	183
	55	183	55
8	120	248	184
	56	184	56
9	121	249	185
	57	185	57
:	122	250	186
	58	186	58
;	123	251	187
	59	187	59
<	124	252	188
	60	188	60
=	125	253	189
	61	189	61
>	126	254	190
	62	190	62
?	127	255	191
	63	191	63

RETURN	141	
	13	
CLR SCREEN HOME	147	
	19	
OFF RVS ON	146	
	18	
CURSOR ↓ ↑	145	
	17	
CURSOR → ←	157	
	29	
INST DEL	148	
	20	
RUN STOP	131	
	3	

Lower Case Mode: Location 59468 / XXXX110X, Same Except 193 to 218 Prints as Lower Case a to z Plus Different Graphics:

	105	233	169
✓	122	250	186
	94	222	222
	95	223	223

Software available from Home Computer Centre, 6101 Yonge Street, Willowdale, Ontario, M2M 3W2, telephone (416)222-1166.

Music

Play music on your PET, includes "DIXIE" on the program or you can compose your own music and replay it again and again. $12.00.

Entry

Formatted key entry program for business application; use cassette, memory, or external or virtual combination of them as storage. Can also be used for media conversion. $12.00.

Day/Timer

Display analog clock on your PET, AM/PM change background, set alarm and appointments, message for appointment, also instant time response from all over the world. $12.00.

Monitor

Include memory dump in hex, octal, decimal and disassembler on ALL OF PET MEMORY LOCATION. Machine language loading and modification from cassette tape or keyboard. $20.00.

Graph

Generate more than 30 different graphic patterns on the PET display, with precise time control. Controls are from keyboard or from the cassette data. $12.00.

If PRINTing to cassette file, you can use more than one variable in a PRINT# by including "," between variables: PRINT#1,N","X$.

Workbooks:

Workbooks available from: Total Information Services P.O. Box 921, Los Alamos, NM 87544.

Getting Started	$4.00	USD
Strings and Arrays	3.95	"
Graphics	4.95	"

Number to Keyboard Conversion

0: End of line
1-31: unused
32: space
33: !
34: "
35: #
36: $
37: %
38: &
39: '
40: (
41:)
42: *
43: +
44: ,
45: -
46: .
47: /
48: 0
49: 1
50: 2
51: 3
52: 4
53: 5
54: 6
55: 7
56: 8
57: 9
58: :
59: ;
60: <
61: =
62: >
63: ?
64: @
65: A
66: B
67: C
68: D
69: E
70: F
71: G
72: H
73: I
74: J
75: K
76: L
77: M
78: N
79: O
80: P
81: Q
82: R
83: S
84: T
85: U
86: V
87: W
88: X
89: Y
90: Z
91: [
92: \
93:]
94: ↑
95: ←
96: space
97: !
98: "
99: #
100: $
101: %
102: &
103: '
104: (
105:)
106: *
107: +
108: ,
109: -
110: .
111: /
112: 0
113: 1
114: 2
115: 3
116: 4
117: 5
118: 6
119: 7
120: 8
121: 9
122: :
123: ;
124: <
125: =
126: >
127: ?
128: END
129: FOR
130: NEXT
131: DATA
132: INPUT#
133: INPUT
134: DIM
135: READ
136: LET
137: GOTO
138: RUN
139: IF
140: RESTORE
141: GOSUB
142: RETURN
143: REM
144: STOP
145: ON
146: WAIT
147: LOAD
148: SAVE
149: VERIFY
150: DEF
151: POKE
152: PRINT#
153: PRINT
154: CONT
155: LIST
156: CLR
157: CMD
158: SYS
159: OPEN
160: CLOSE
161: GET
162: NEW
163: TAB(
164: TO
165: FN
166: SPC(
167: THEN
168: NOT
169: STEP
170: +
171: -
172: *
173: /
174: ↑
175: AND
176: OR
177: >
178: =
179: <
180: SGN
181: INT
182: ABS
183: USR
184: FRE
185: POS
186: SQR
187: RND
188: LOG
189: EXP
190: COS
191: SIN
192: TAN
193: ATN
194: PEEK
195: LEN
196: STR$
197: VAL
198: ASC
199: CHR$
200: LEFT$
201: RIGHT$
202: MID$
203-254: unused
255: π

USING THE PET COMPUTER

Note:- Words in a rectangle indicate a key to be pressed on the PET keyboard, capitals are individual letters to be typed.

To enter and run a program

1. Type NEW then [RETURN] . This will clear out any old programs in the useable memory.
2. Now type the program letter by letter on the keyboard, it will go into memory and also appear on the screen. At the end of each line you must press [RETURN] .
3. After you have typed the entire program correctly you are ready to run it. Type RUN then press [RETURN] and the program will start to operate.

To correct errors

1. The flashing cursor tells you where the next letter will go.
   (a) to move the cursor to the right press [CURSOR ←→] once for each space.
   (b) to move the cursor to the left hold [SHIFT] down and press [CURSOR ←→] once for each space.
   (c) to move the cursor down press [CURSOR ↑↓] once for each line.
   (d) to move the cursor up hold [SHIFT] down and press [CURSOR ↑↓] once for each line.

2. To change an instruction or part of one, move the cursor to the last correct part of the instruction and then type the correct part on top of the incorrect characters, to the end of that line, Be sure to put spaces on top of any letters left after the correction is made, press [RETURN] at the end.

3. To delete characters. Move the cursor to right of last character you wish to delete then press [INST DEL] . This removes the character it is over and moves everything after it left one space.

4. To insert characters. Move the cursor until it is located where the insertion is needed, then hold [SHIFT] down, press [INST DEL] followed by the character you wish to insert. You need to hold [SHIFT] down and press [INST DEL] for each letter you insert.

To load a program from tape

1. Place the casette in the recorder but do not press any buttons on the tape recorder.
2. Type LOAD followed by the name of the program, if no name is typed it will load the next program on tape.
3. When the computer is ready it will ask you to press the play button on the tape recorder.
4. If the tape loads correctly the computerwill then start to run the program. If there is just a ready indication you may have to type RUN. If there is an error in loading from tape, rewind the tape and start the loading instructions over.

Information on the screen

1. You may clear the screen and send the cursor to the upper left corner by holding down [SHIFT] and pressing [CLR HOME].
2. If you wish to get a listing of the program in memory at any time type LIST then [RETURN].
3. When the screen is full the first lines get lost at the top and new lines continue to be added at the bottom. If this happens during the listing of a program and you wish to examine some steps before they go off the top pressing [RUN/STOP] will stop the listing. Actually pressing [RUN/STOP] at any time stops the computer and if during the operation of your program it will tell you at what step you stoped it.

TEST FOR A PRIME NUMBER (BASIC)

```
10   PRINT "TYPE A WHOLE NUMBER"
20   INPUT A
30   IF A = 0 GO TO 999
40   IF A = 1 GO TO 200
50   IF A = 2 GO TO 220
60   B = 2
70   C = A/2
80   D = A/B
90   E = INT(D)
95   F = B * E
100  IF F = A GO TO 240
110  IF B > C GO TO 260
120  B = B + 1
130  GO TO 80
200  PRINT " 1 IS SPECIAL"
210  GO TO 10
220  PRINT " 2 IS A PRIME"
230  GO TO 10
240  PRINT A " IS NOT A PRIME"
250  GO TO 10
260  PRINT A " IS A PRIME"
270  GO TO 10
999  END
```

TO SORT UP TO 20 NUMBERS INTO ASCENDING ORDER

```
10   DIM A(20)
20   PRINT "HOW MANY NUMBERS TO SORT"
30   INPUT N
40   IF N = 0 GO TO 230
50   PRINT " GIVE ME" N "  NUMBERS"
60   FOR K = 1 TO N
70   INPUT A(K)
80   NEXT K
90   J = N - 1
100  FOR M = 1 TO J
110  FOR I = 1 TO J
120  IF A(I) < A(I+1) GO TO 160
130  B = A(I+1)
140  A(I+1) = A(I)
150  A(I) = B
160  NEXT I
170  NEXT M
180  PRINT "THE NUMBERS IN ASCENDING ORDER"
190  FOR K = 1 TO N
200  PRINT A(K)
210  NEXT K
220  GO TO 20
230  PRINT "FINIS"
240  END
```

TABLE OF SQUARES, CUBES, ROOTS

```
10  PRINT " TYPE A STARTING NUMBER"
20  INPUT A
30  PRINT " TYPE THE ENDING NUMBER"
40  INPUT B
50  PRINT " [SHIFT] [CLR HOME] "
60  PRINT "N      SQUARE     CUBE       ROOT"
70  FOR N = A TO B
80  C = N↑2
90  C = INT(C)
100 D = N↑3
110 D = INT(D)
120 E = SQR(N)
130 PRINT N;
140 PRINT TAB(6);C;
150 PRINT TAB(16);D;
160 PRINT TAB(26);E
170 NEXT N
999 END
```

DIFFERENCES BETWEEN PET BASIC AND FORTRAN

In General

BASIC is an interpreter, interpreting and executing each statement as it comes to it.

FORTRAN is a compiler and makes two compiling passes before it attempts to execute.

Statements

All statements must be numbered in BASIC as it executes them in numerical order.

Only statements to which you transfer may be numbered and must be numbered, numerical order means nothing.

Constants and Variables

All constants and variables are real until you use the Integer function
A = INT(B) truncates the value of B and puts it in A.
Can get garbage in 9th digit

Has both integer and real arithmetic and variable names. Must be careful of mixed mode. Has double precision for extra accuracy.

Arithmetic

BASIC uses A↑2 for A^2

FORTRAN uses A * 2 for A^2

Decisions

BASIC IF is a logical if
e.g. IF A = B
IF A < B
IF A >= B etc

FORTRAN is a logical if
e.g. IF(A-B) 2,3,4

Looping

BASIC
```
FOR N= 1 TO 20
 ...
 ...
NEXT N
```

FORTRAN
```
DO 10 N= 1, 20
 ...
 ...
CONTINUE
```

Input

INPUT A,B stops calculating and waits for two numbers to be typed on keyboard and return button to be pushed

READ A,B takes information from a DATA statement in sequence

READ(8,2)A,B
2 FORMAT (2F8.2) for card read

Some versions of FORTRAN have simpler unformated reads.

Output

PRINT A,B,C prints values at 10,20,30,40

PRINT A;B;C prints 3 spaces apart

PRINT "HELLO" prints characters in quotes

BASIC also has TAB and signals at the end of the statement for more detailed spacing

```
WRITE(3,5)A,B,C
5 FORMAT(1X,3F15.2) format is
  more complicated but allows
  for great flexibility
```

Some FORTRANS have an output much like BASIC.

Subscripts

Dimension is DIM A(n)

Can have up to 4 subscripts in PET BASIC and 256 limit to their size.

Most FORTRANS only allow triple subscripts, Dimension statement is DIMENSION

Subroutines

GOSUB L in BASIC
Must know the statement number of the routine, and be sure you use the same names of variables to communicate with a subroutine and subroutine may destroy your variables if you use the same names

CALL NAME(a,b,c...) in FORTRAN
Linkage is through the calling sequence and the subroutine is compiled at a different time, hence the actual variable name is not significant. Better for large programs.

Comments

REM followed by printing is not executed by the program, only used to help the reader and programmer tell what is taking place in the program

C. COMMENT followed by printing is not executed by the program, only to give notes to those who read the program.

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USER'S REPORT ON COMMODORE PET-2001-8K

Actually it took me a long time to decide which microcomputer to order. I think I was not alone with this problem, because the number of available microcomputers on the market is really incredible and each one has different features and different price tag.

Then in June 1977, I went to NCC in Dallas, and saw the PET. Before, I was thinking about a microcomputer kit, but after seeing PET, I immediately decided to place the order right at NCC for this assembled and ready-to-run unit. It had everything I needed: CRT, cassette drive, keyboard and MOS-6502 microprocessor with enough memory in one unit, quite powerful BASIC in ROM and the price was right.

In general, I am quite pleased with the performance of the PET. I like the compactness of the PET, because I don't have too much space in my apartment, and as a matter of fact, my Computer Centre is located right in one corner of my kitchen. I don't have to say that I spend more time in the kitchen doing programming than cooking.

I found the COMMODORE BASIC quite powerful and pretty fast. It is one of the fastest versions of BASIC available on the microcomputer market today and considering that it occupies just over 8K bytes, its instruction set is more than adequate.

When I placed the order I was promised 90 days delivery date. COMMODORE immediately cashed my cheque for $795, but was unable to deliver it for 5 months. Only after contacting Mr. Webb from Canadian branch of COMMODORE, who personally took the matter in his hands, I was able to pick up the PET at the International Toronto Airport within a week.

The PET arrived with the case damaged and without any manual, or demonstration cassette, but after waiting for five months who would care about such things. The COMMODORE here could not help, as they were not selling the machines here yet, and by sending it to California I would have to wait another 8 weeks for repair + the transportation.

Sometime in November I sent BUG-report to COMMODORE, Palo Alto and until today I haven't received any reply. I know of more people who went through similar troubles, so I wouldn't recommend to anybody to order anything from Palo Alto. Then after two months of using the machine, suddenly the tape drive could not read any labels on the pre-recorded cassettes. I had to wait 7 weeks for a new tape drive and when it finally arrived, I found out, I could not read any of my old programs, because of the incompability problems between the two tape drives.

The COMMODORE response time is really, really slow. I sent two programs to Palo Alto for sale and it took them nearly four months to evaluate them and get in touch with me.

Soon COMMODORE BUSINESS MACHINES INC. is going to distribute the application software and various games on pre-recorded cassettes. The programs will be sold as packages of two or more programs on one cassette and the estimated price will be $10-20 per cassette. There will be approximately 75 programs in the first release.

FOUND PROBLEMS:

1. Array addressing problems (0-255 size limit)

2. Arithmetic errors (in some cases .000001 error)

3. SPC(0) results in SPC(256)

4. Empty input (simple depression of RETURN-key) terminates the program. This can be handy sometimes, if you want to get out of the program at any prompt command, but in other instances it can be a nuisance and you have to restart the program.

5. BACK SPACE - very unfortunate design of this key. You have to depress SHIFT and CURSOR, which requires 2 fingers (if you are backspacing after one quote, you have to depress the quote again in order to switch off the reverse mode).

PLUS:

Compactness - CRT, processor, keyboard, tape drive in one unit

Price - the best price/performance ratio on the microcomputer market today

Speed - very fast and powerful BASIC

Graphics - very good graphic capabilities

PET USERS GROUP

MINUS:

Keyboard - too small and inconvenient for entering of lengthy programs

Tape drive - not very reliable,
not the best compability with other PET drives

Documentation- not sufficient

Software bugs- as described above.

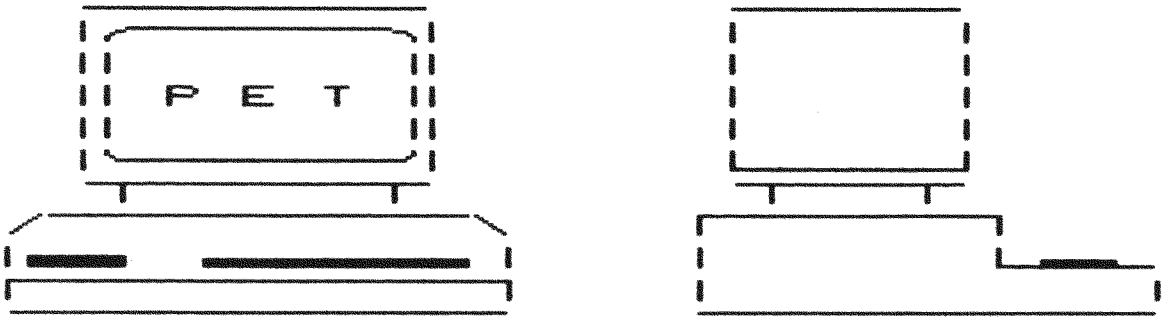
Comment: From Commodore (Canada)

1. Repairs and servicing are now available at C.B.M., 3370 Pharmacy Avenue, Agincourt, Ontario.

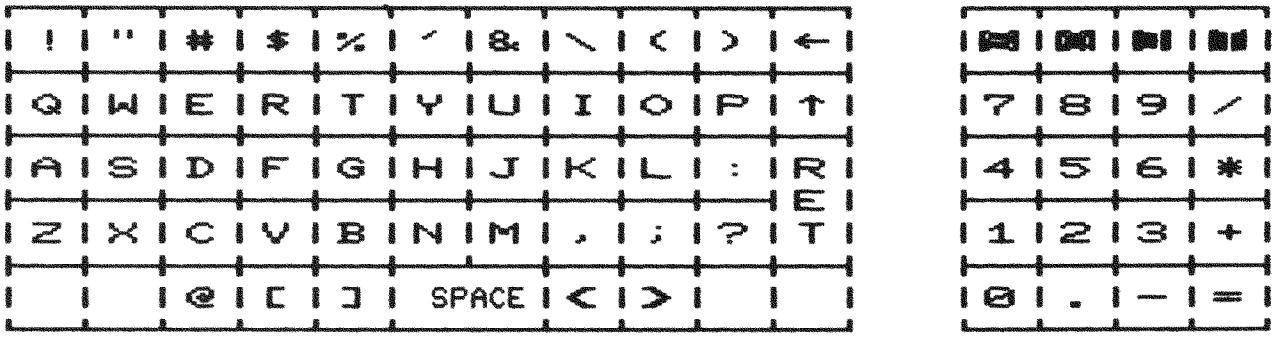
2. Better documentation is being published in later editions of this Bulletin.

3. A PET with a large keyboard will be available in 1979.

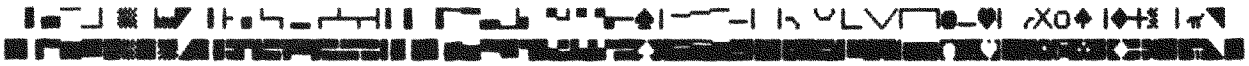
```
READY.

 1 OPEN5,4:CMD5
 2 PRINTCHR$(26):PRINTCHR$(7):PRINTCHR$(7)
 10 DIMA$(75),B$(75)
 20 FORI=0TO74
 30 READA$(I),B$(I)
 40 NEXT
 50 PRINT"{CLR}THIS PROGRAM WILL TEST YOUR KNOWLEDGE OFWORLD CAPITAL CITIES."
 60 PRINT:PRINT:PRINT"AFTER EACH STATE (SELECTED AT RANDOM)"
 65 PRINT"PLEASE TYPE IN THE APPROPRIATE CAPITAL  FOLLOWED BY A 'RETURN'."
 80 PRINT:PRINT
 90 N=0:C=0:W=0
 100 N=N+1:IFN>10THEN400
 105  I=74*RND( 6)
 106  I=INT(I)
 108 Q=0
 110 PRINT:PRINT:PRINT"WHAT IS THE CAPITAL OF "          ;A$(I);
 115 PRINT:INPUTZ$
 120 IFZ$=B$(I)THEN200
 130 PRINT"NOT CORRECT!...TRY AGAIN":W=W+1
 140 Q=Q+1:IFQ>=2THEN800
 150 GOTO110
 200 R=4*RND( 1)   :C=C+1
 201 R=INT(R)
 210 IFR=1THEN300
 220 IFR=2THEN301
 230 IFR=3THEN302
 240 IFR=4THEN303
 250 PRINT"CORRECT..YOU'RE A GENIUS!":GOTO100
 300 PRINT"RIGHT ON, BABY!":GOTO100
 301 PRINT"ALL RIGHT!!":GOTO100
 302 PRINT"YES SIR!!":GOTO100
 303 PRINT"YOU'RE TOO MUCH!":GOTO100
 400 PRINT"{CLR}YOUR SCORE IS";C;"CORRECT,";W;"WRONG"
 401 PRINT:PRINT"RATING";C/(C+W)*100;"%"
 402 PRINT:PRINT:PRINT"DO YOU WISH TO CONTINUE THE LESSON      (TYPE YES OR NO)?
"
 403 INPUTC$
 404 IFC$="YES"THEN90
 405 IFC$="NO"THEN830
 406 GOTO402
 600 DATAAFGHANISTAN,KABUL,ANGOLA,LUANDA,ALGERIA,ALGIERS,ARGENTINA,BUENOS AIRES
 610 DATAAUSTRALIA,CANBERRA,AUSTRIA,VIENNA,BELGIUM,BRUSSELS,BOLIVIA,SUCRE
 620 DATABRAZIL,BRASILIA,BULGARIA,SOFIA,BURMA,RANGOON,CAMBODIA,PHNOM PENH
 630 DATACANADA,OTTAWA,CHILE,SANTIAGO,COLUMBIA,BOGOTA,COSTA RICA,SAN JOSE
 640 DATACUBA,HAVANA,CYPRUS,NICOSIA,CZECHOSLOVAKIA,PRAGUE,DENMARK,COPENHAGEN
 650 DATADOMINICAN REPUBLIC,SANTO DOMINGO,ECUADOR,QUITO,EGYPT,CAIRO
 660 DATAEL SALVADOR,SAN SALVADOR,ETHIOPIA,ADDIS ABABA,FINLAND,HELSINKI
 670 DATAFRANCE,PARIS,W.GERMANY,BONN,E.GERMANY,BERLIN,GREECE,ATHENS
 680 DATAGUATEMALA,GUATEMALA CITY,GUYANA,GEORGEROWN,HAITI,PORT-AU-PRINCE
 690 DATAHONDURAS,TEGUCIGALPA,HUNGARY,BUDAPEST,ICELAND,REYKJAVIK
 700 DATAINDIA,NEW DELHI,IRAN,TEHRAN,IRAQ,BAGHDAD,IRELAND,DUBLIN
 710 DATAISRAEL,JERUSALEM,ITALY,ROME,JAMAICA,KINGSTON,JAPAN,TOKYO,JORDAN,AMMAN
 720 DATAKENYA,NAIROBI,LEBANON,BEIRUT,LIECHTENSTEIN,VADUZ,LUXEMBOURG,LUXEMBOURG
 730 DATAMALTA,VALLETTA,MEXICO,MEXICO CITY,MOROCCO,RABAT,NETHERLAND,AMSTERDAM
 740 DATANEW ZEALAND,WELLINGTON,NICARAGUA,MANAGUA,NIGERIA,LAGOS,NORWAY,OSLO
 750 DATAPARAGUAY,ASUNCION,PERU,LIMA,POLAND,WARSAW,PORTUGAL,LISBON,SPAIN,MADRID
 760 DATASUDAN,KHARTOUM,SWEDEN,STOCKHOLM,SWITZERLAND,BERN,SYRIA,DAMASCUS
 770 DATATHAILAND,BANGKOK,TURKEY,ANKARA,UGANDA,KAMPALA,USSR,MOSCOW,USA,WASHINGTO
N
 780 DATAU.K.,LONDON,URUGUAY,MONTEVIDEO,VENEZUELA,CARACAS,YUGOSLAVIA,BELGRADE
 800 PRINT"{CLR}WELL,I GUESS YOU REALLY DON'T KNOW IT!! (SHAME)"
 810 PRINT:PRINT:PRINT"THE CORRECT ANSWER IS '";B$(I);"'
 815 PRINT:PRINT"NOW I WILL ASK YOU AGAIN!"
 820 GOTO108
 830 END
READY.
```



PORTRAIT OF 2001 BY 2020



THE PET GRAPHICS



This is the PET 2020 PRINTER.

A fast, intelligent peripheral designed to attach to any IEEE-488 device, in particular, the PET 2001 PERSONAL COMPUTER. It uses a 7 needle Impact printer able to print through 3 copies. Running at a speed of 120 cps, printing lines up to 80 characters in length.

It features UPPER-lower case, [redacted], OR, **Bold**, fully formatted printing.

THE SELLING PRICE IS $695

All this is implemented by using a Commodore 6500 series Microprocessor, 2 6532 RAM-I/O chips and a 32-K ROM.

The **bold**, [redacted] and lower case are all accomplished by, up-shift, down-shift or control characters which are programmable from PET BASIC.

The full PET graphics set is available in an 8X7 dot matrix form allowing cotinuous graphics.

Of course it can also list PET programs.

```
10 PRINT"[CLR]"
20 INPUT"NUMBER";A
30 FOR I=2 TO SQR(A)+1
40 IF (A/I)=INT(A/I) THEN PRINT A"IS NOT PRIME":GOTO 20
50 NEXT
60 PRINT A;"IS PRIME"
70 GOTO 20
```

The PET 2020 PRINTER has full formatting capability allowing

```
SUPPRESSED LEADING ZEROS       9.45
FORCED LEADING ZEROS        0009.45
FLOATING DOLLAR SIGN        $595.00
FIXED DOLLAR SIGN         $  595.00
OR ALPHANUMERIC

AN EXAMPLE FORMAT MIGHT BE

AAAAAAA      999       $$$$.99

WHICH WOULD FORMAT DATA LIKE THIS

ORANGES       25         $4.45
```

```
 ERROR

READY.

 1 REM*****SQUIGGLE VERSION 2.0*****
 2 REM IDEA BY PAUL HITTLE
 3 REM PROGRAMMING BY B.SEILER, G.YOB
 4 REM CLEAR SCREEN TO START
 5 PRINT"■";
 9 REM SQUIGGLE GRAPHICS CHARACTERS
 10 DATA"│","─","┘","└","┌","┐"
 18 REM CHARACTERS FOR EACH DIRECTION
 19 REM 20-UP,30-DOWN,40-RIGHT,50-LEFT
 20 DATA1,0,5,6
 30 DATA0,1,4,3
 40 DATA3,6,2,0
 50 DATA4,5,0,2
 55 REM A$ HOLDS CHARS, B HOLDS PTRS
 56 REM FOR EACH DIRECTION
 60 DIMA$(5),B(5,5)
 65 REM SET UP A$ AND B()
 70 FORI=0TO5
 80 READA$(I)
 90 NEXT I
 100 FORI=1TO4
 110 FORJ=1TO4
 120 READB(J,I)
 130 NEXT J
 140 NEXT I
 150 REM INITIAL VALUES
 160 REM T1,T2 = DIRECTION OF TRAVEL
 161 REM T1 IS CURRENT DIRECTION
 162 REM T2 IS PREVIOUS DIRECTION
 163 REM 1=UP, 2=DOWN, 3=RIGHT, 4=LEFT
 170 REM
 180 REM X,Y ARE POSITION OF WRIGGLER
 181 REM ON SCREEN. 0,0 IS UPPER LEFT
 182 REM CORNER (CURSOR HOME)
 183 REM 20,12 IS CENTER OF SCREEN
 190 T1=1
 200 T2=1
 210 X=20
 220 Y=12
```

```
 250 REM GET RANDOM FACTOR
 260 PRINT"WIGGLE FACTOR(0-9)";
 265 PRINT"▒▒";:FOR J=1TO130:NEXTJ
 266 PRINT" ▒▒";:FOR J=1TO100:NEXTJ
 270 GET W$:IFW$=""THEN265
 275 IF W$<"0" OR W$ >"9" THEN 260
 280 W=VAL(W$)/10+.1
 290 PRINT"▒";
 300 REM***MAIN LOOP***
 301 REM ** TURN OR NOT??
 305 IF RND(1)>W*W THEN 325
 306 REM YES, DO TURN
 310 T1=4*RND(1)+1
 320 IFB(T1,T2)=0THEN310
 324 REM DRAW MOVE ON SCREEN
 325 GOSUB2000
 330 T2=T1
 339 REM UPDATE POSITION
 340 ONT1GOTO400,410,420,430
 400 Y=Y-1:GOTO500
 410 Y=Y+1:GOTO500
 420 X=X+1:GOTO550
 430 X=X-1:GOTO550
 490 REM ADJUST FOR WRAP-AROUND
 500 IFY<1THENY=23:GOTO300
 510 IFY>23THENY=1:GOTO300
 550 IFX<1THENX=39:GOTO300
 560 IFX>39THENX=1:GOTO300
 570 GOTO300
 1990 REM ***DRAWING SUBROUTINE***
 1991 REM POSITION CURSOR AT X,Y
 2000 PRINT"▒";
 2010 FORI=1TOY
 2020 PRINT"▒";
 2030 NEXT I
 2040 FORI=1TOX
 2050 PRINT"▒";
 2055 NEXT I
 2060 REM PRINT THE CHARACTER
 2080 PRINTA$(B(T1,T2)-1);
 2090 RETURN
READY.
```

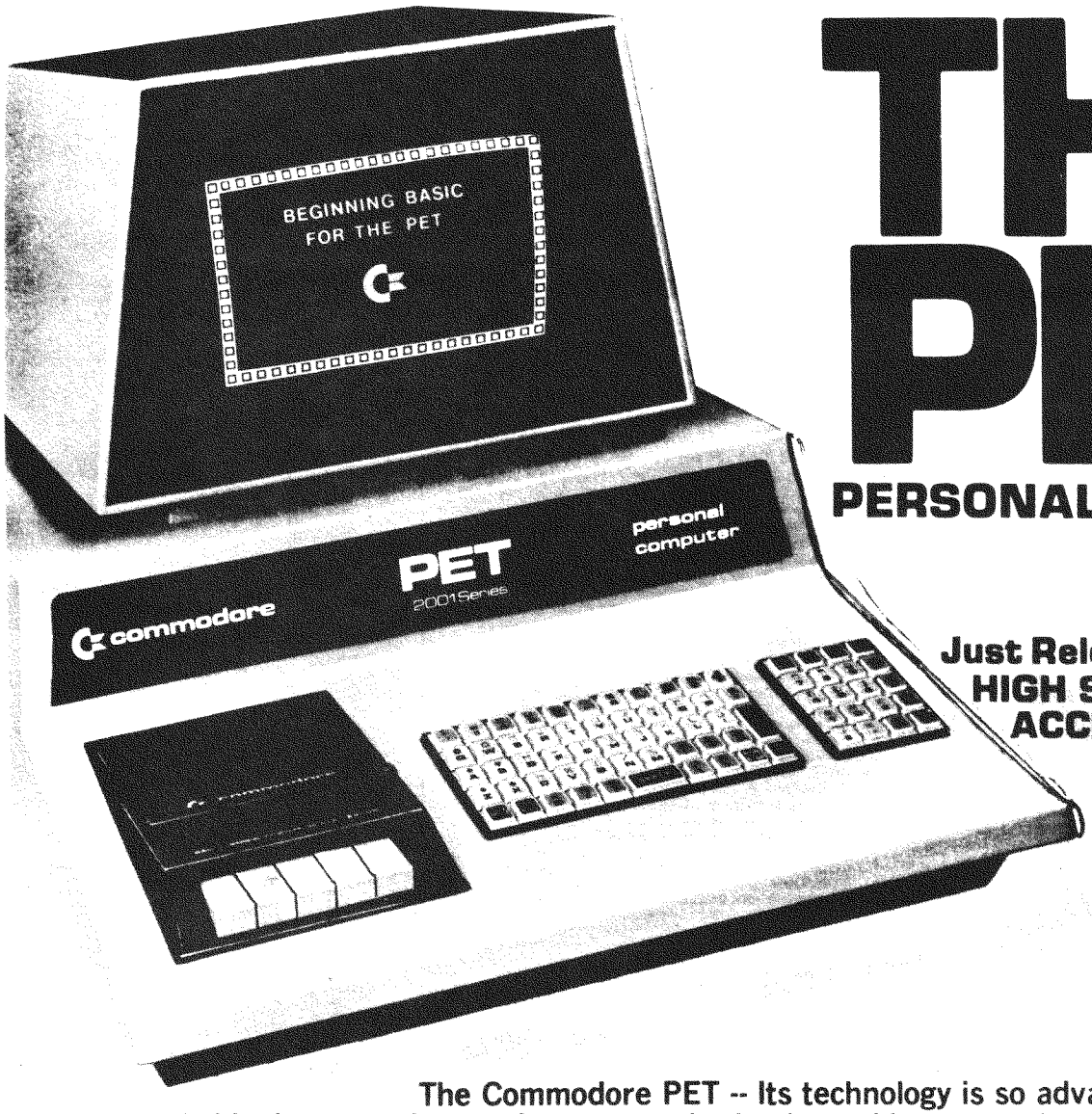
READY.

READY.

```
 10 REM BIG TIME 2.0 NON-STOP
 15 REM ORIGINALLY BY SCOTT MAUCUS
 16 REM MODIFIED BY B. SEILER
 20 DIM A$(9)
 30 FOR I=0 TO 9
 35 REM SET UP A DIGIT
 40 FOR J=1 TO 5
 50 READ A$
 55 REM   MOVE CURSOR DOWN & 3 LEFT
 60 A$(I)=A$(I)+A$+"■■■■"
 70 NEXT J
 80 READ A$
 85 REM   MOVE CURSOR RIGHT & 5 UP
 90 A$(I)=A$(I)+A$+"■TTTT]"
100 NEXT I
190 REM ASK FOR TIME
200 PRINT"■                    MINUTES"
220 PRINT"              HOURS──┐  |  ┌──SECONDS"
240 PRINT"                     |  |  |"
260 PRINT"PLEASE INPUT TIME  HHMMSS":PRINTSPC(17);
300 INPUTA$
340 REM SET TIME HERE
350 TI$=A$
360 REM DRAW "TIME" WORD
370 GOSUB8000
390 REM DRAW BORDER BOX
400 GOSUB5000
490 REM MAIN LOOP
495 REM   POSITION CURSOR @ 1 ST DIGIT
500 PRINT"■■■■■■■■■■■■■■■■■■■";
590 REM   DRAW NUMERALS FOR TIME
600 FORI=1TO6
650 PRINTA$(VAL(MID$(TI$,I,1)));
660 REM INSERT COLON TWEEN HH-MM,MM-SS
670 IFI=2ORI=4THENPRINT"■O■■■■O■TTTT]";
700 NEXT I
800 GOTO500
```

```
990 REM DIGITS DATA STRINGS
1000 DATA"/‾‾\"
1010 DATA"|   |"
1020 DATA"|   |"
1030 DATA"|   |"
1040 DATA"|   |"
1050 DATA"\___/"
1100 DATA" /| "
1110 DATA"  | "
1120 DATA"  | "
1130 DATA"  | "
1140 DATA"  | "
1150 DATA" _|_"
1200 DATA"/‾‾\"
1210 DATA"    |"
1220 DATA" __/"
1230 DATA"/    "
1240 DATA"|    "
1250 DATA"|____"
1300 DATA"/‾‾\"
1310 DATA"    |"
1320 DATA" __/"
1330 DATA"    \"
1340 DATA"    |"
1350 DATA"\___/"
1400 DATA"|   |"
1410 DATA"|   |"
1420 DATA"|   |"
1430 DATA"‾‾‾|"
1440 DATA"    |"
1450 DATA"    |"
1500 DATA"|‾‾‾"
1510 DATA"|__  "
1520 DATA"    \"
1530 DATA"    |"
1540 DATA"    |"
1550 DATA"\___/"
1600 DATA"/‾‾\"
1610 DATA"|    "
1620 DATA"|__  "
1630 DATA"|   \"
1640 DATA"|   |"
1650 DATA"\___/"
1700 DATA"|‾‾‾|"
1710 DATA"    /"
1720 DATA"   / "
1730 DATA"  |  "
1740 DATA"  |  "
1750 DATA"  |  "
1800 DATA"/‾‾\"
1810 DATA"|   |"
1820 DATA"\___/"
1830 DATA"/   \"
1840 DATA"|   |"
1850 DATA"\___/"
1900 DATA"/‾‾\"
1910 DATA"|   |"
1920 DATA"\___|"
1930 DATA"    |"
1940 DATA"    |"
1950 DATA"\___/"
```

```
 4999 REM WRITE BORDER FOR DIGITS
 5000 PRINT" ";
 5010 FORI=1TO37:PRINT"_";:NEXT:PRINT
 5020 PRINT" "SPC(35)" "
 5040 FORI=1TO2
 5050 PRINT" "SPC(I)"\"SPC(35-2*I)"/"SPC(I)" "
 5060 NEXT
 5070 PRINT"   ";:FORI=1TO29:PRINT"";:NEXT:PRINT"   "
 5100 FORI=1TO8
 5110 PRINT"   "SPC(29)"   "
 5120 NEXT
 5200 PRINT"   ";:FORI=1TO29:PRINT"_";:NEXT:PRINT"   "
 5340 FORI=2TO1STEP-1
 5350 PRINT" "SPC(I)"/"SPC(35-2*I)"\"SPC(I)" "
 5360 NEXT
 5420 PRINT" "SPC(35)" "
 5510 PRINT" ";:FORI=1TO37:PRINT"";:NEXT:PRINT
 6000 RETURN
 8000 REM TIME HEADER
 8030 PRINT"";
 8040 W=10
 8050 PRINTSPC(W)"
 8060 PRINTSPC(W)"
 8070 PRINTSPC(W)"
 8080 PRINTSPC(W)"
 9000 RETURN
READY.
```



THE PET™

PERSONAL COMPUTER

Just Released
HIGH SPEED PRINTER ACCESSORY

Featuring an IEEE-488 BUS

The Commodore PET -- Its technology is so advanced; its concept, so remarkable; its ease of operation, so utterly simple, and its cost so incredibly low, that overnight it has given rise to a brand new era -- The Age of the Personal Computer.

THE PET has become the standard for the emerging personal computer industry. Computer magazines, trade journals, consumer and business publications have lauded its discovery. POPULAR SCIENCE put THE PET on its October, 1977 cover, in full color, and devoted a feature news story to the coming revolution in personal and office computing. PLAYBOY, February, 1978, gave full color coverage to the "mind-boggling" PET.

IN A LEAGUE WITH IBM, HP AND WANG MINICOMPUTERS

THE PET should not be confused with game products that hook up to household T.V.'s. It is a minicomputer. What sets THE PET light years apart from other computers is its price. While the others cost from $11,000 to $20,000 and more, THE PET, with similar capabilities and power, costs only $1,200.

One extremely important capability shared with HP's minicomputer, and full size computers, is its IEEE-488 Bus. This standard data/control channel means your PET can be directly connected to a variety of peripherals and laboratory measuring equipment. Over 120 pieces of compatible equipment such as counters, timers, spectrum analyzers, digital voltmeters and printer plotters from manufacturers such as HP, Phillips, Fluke, and Textronix are currently available.

ROM Magazine, January 1978, writes, "THE PET comes out of the box, plugs into the wall, and is ready to use." It is equipped with a CRT video display with reverse and blink features, an alpha-numeric keyboard with complete graphics and a built-in standard cassette tape deck.

THE PET is an exceptionally powerful think tank with 8K bytes of RAM (User Memory). Optional equipment, permits expansion to 32K. The system contains 14K bytes of ROM (Program Memory).

THE PET COMMUNICATES IN THE EASIEST COMPUTER LANGUAGE

Computers talk in many languages. The easiest is BASIC or English-like words. If THE PET wants you to press a key, it will flash, "Press such and such", right on the display. You speak back to THE PET through its full size 73-key keyboard.

EXTENSIVE CHARACTER ORIENTED GRAPHICS

The unit features a 9-inch, high resolution, 1000 character CRT. Characters are arranged 40 columns by 25 lines on an 8 x 8 matrix for superb graphics.

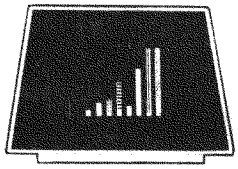
WHAT IS THE PET REALLY FOR?

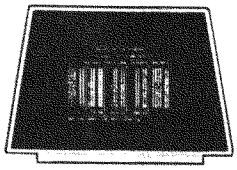
It is the single most important teaching device for any computer related subject. It can help a youngster learn number facts, or help a med student do tissue analyses. It will entertain the most sophisticated data application, or the simplest inquiry-response assignment.

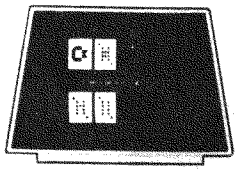
IN THE LAB it handles instrumentation, process monitoring, computer aided instructions, and more. A number of Fortune 500 companies have already made PETS an integral part of their lab and general office system.

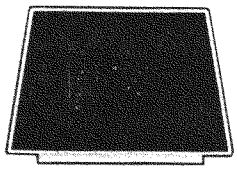
As a **BUSINESS TOOL** it will; Maintain ledgers. Illustrate cash flow charts. Keep payroll records. Create P & L's. Control inventory. Store and analyze sales data. Draw bar graphs. Issue invoices. Do statistical work. Hook up to on-line computer system.

THE PET is the only totally integrated, self-contained, personal computing system. It measures a compact 16½" wide; 18½" deep; 14" high, and weighs just 44 pounds.


Bar Graphs


Amortization Chart


Blackjack


Teaching Trigonometry

As an **AT-HOME TOOL** it will; Compute state and federal tax returns. Make heat and insulation analyses. Keep Christmas lists. Keep checkbook and finances up to date. Programs are even being developed to store recipes and to compute larger or smaller portion requirements.

WHO IS THE PET FOR?

Engineers, scientists, doctors, educators, students of computer science, attorneys, stock brokers, realtors, insurance people, list brokers, home economists, churches, grocery store owners, automobile dealers, sales people, organizations.

JUST FOR FUN

There is hardly a game, from Blackjack to Master Chess, that cannot be programmed into the unit. A variety of game programs is currently available.

ANNOUNCING THE PET PRINTER

This powerful word processing accessory lets you print hardcopies, invoices, and computer correspondence. Faster than an IBM Selectric, THE PET Printer delivers 60 characters per second at a sustained rate -- or 3,600 characters every minute -- with upper and lower case capability. Characters are 1/8" tall and printed in a 7 x 8 dot matrix. The printer uses a standard 8½" wide paper roll. And, most unbelievable -- it is only $850.00.

PERIPHERAL SECOND CASSETTE

This optional component expands storage and increases flexibility. Only $130.00.

MILES OF SOFTWARE

Listed below is a sampling of currently available PET programs. "BASIC BASIC" shows you how to write a program for the unit. You can actually develop your own programs to meet personal requirements.

GAME PROGRAMS ARE $11.00 EACH

☐ **Black Jack** ☐ **Draw Poker** ☐ **Galaxy Games**
☐ **Space Flight** ☐ **Target Bong, Off-The-Wall**
☐ **Lunar Lander, Wumpus, Rotate, Tic-Tac-Toe**
☐ **Osero, Reverse** ☐ **Spacetrek** ☐ **Kingdom**

PROGRAMS AT $16.00 EACH

☐ **Mortgage Analysis** ☐ **Diet Planner and Biorhythm**
☐ **Basic Basic**-by Lodewyck and James

PROGRAMS AT $27.00 EACH

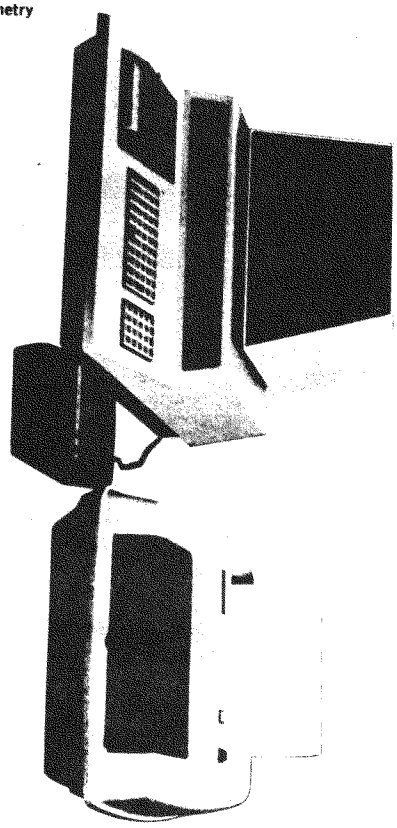
☐ Basic Investment Analysis-loans, annuities, return on regular and irregular sequences of payments, calendar calculations ☐ **Stock Portfolio Recordkeeping and Analysis**-keeps track of buys, sells, and dividends. Calculates current value, rates of return ☐ **Checkbook Recordkeeping and Analysis**-keeps track of checks and deposits. Analyzes expenses by date and type

PROGRAMS AT $32.00 EACH

☐ **Basic Math Package**-matrix addition, multiplication, determinants and inverses to 16 x 16, solution of simultaneous linear equations, vector and plane geometry calculations, integration by trapezoidal, Simpson's rule or Gaussian quadrature, differentiation
☐ **Basic Statistics Package**-mean, median, variance, standard deviation, skewness, kurtosis, frequency distribution, linear regression, T-tests, correlation analyses

FREE ORIENTATION PACKAGE

Your PET comes complete with two programs and an easy-to-follow instruction manual. By working through the routines you will quickly discover how easy it is to gain command of your personal computer.



PET and Peripherals. The external cassette (the PET CASSETTE™ model C2N) is shown connected to the cassette port and ready for file management.

Also shown is the PET Printer, model 2020, capable of printing up to 80 characters per line on 8½" roll or fan-fold paper. It prints the entire complement of PET alphanumerics and graphics at approximately 120 CPS on a 7x8 dot matrix. The unit can be programmed to print extended characters as well as a unique character (such as a corporate logo).

TECHNICAL SPECIFICATIONS

MEMORY
Random Access Memory (user memory): 8K internal, expandable to 32K bytes
Read Only Memory (operating system resident in the computer): 14K bytes
8K-BASIC interpreter program
4K-Operating system
1K-Diagnostic routine

VIDEO DISPLAY UNIT
9" enclosed, black & white, high resolution CRT
1000 character display, arranged 40 columns by 25 lines
8 x 8 dot matrix for characters and continuous graphics
Automatic scrolling from bottom of screen
Winking cursor with full motion control
Reverse field on all characters (white on black black on white)
64 standard ASCII characters; 64 graphic characters

KEYBOARD
9½" wide x 3" deep; 73 keys
All 64 ASCII characters available without shift. Calculator style numeric key pad
All 64 graphic and reverse field characters accessible from keyboard (with shift)
Screen Control: Clear and erase
Editing: Character insertion and deletion

CASSETTE STORAGE
Fast Commodore designed redundant-recording scheme, assuring reliable data recovery
Cassette drive modified by Commodore for much higher reliability of recording and record retention
High noise immunity, error detection, and correction
Uses standard audio cassette tapes
Tape files, named

OPERATING SYSTEM
Supports multiple languages (BASIC resident)
Machine language accessibility
File management in operating system
Cursor control, reverse field, and graphics under simple BASIC control
Cassette file management from BASIC
True random number generation or pseudo random sequence

INPUT/OUTPUT
All other I/O supported through IEEE-488 instrument interface for peripherals
I/O automatically managed by operating system software
Single character I/O with GET command
Easy screen line-edit capability
Flexible I/O structure for BASIC expansion with peripherals

BASIC INTERPRETER
8K BASIC; 20% faster than most other 8K BASICS
Upward expansion from BASIC language
Strings, integers, multiple dimension arrays
10 significant digits; floating point
Direct memory access: PEEK and POKE commands

commodore

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TELEX NUMBER 06-525400